

Amendments to the Claims

1-4. (canceled)

5. (New) A feed-forward amplifier, comprising an amplifier portion including a main signal path, a feed-forward signal path, a signal cancellation loop, and an intermodulation cancellation loop, and a detector-controller portion including a signal-power detector/processor and a switch, wherein the switch is operable on start-up to connect the signal-power detector/processor so that it is operable to balance the signal cancellation loop so as to minimize signal power in the feed-forward signal path and thereafter is connected so as to minimize intermodulation in the main signal path downstream of the intermodulation cancellation loop.

6. (New) The feed-forward amplifier of claim 5, wherein the main signal path includes:

an input port;

an output port;

a first main path splitter, an input of which is connected to the input port so that when an input signal applied to the input port it is split by the first main path splitter into a main signal and a feed-forward signal;

a main signal path gain and phase adjuster, an input of which is connected to a first output of the first main path splitter, the main signal path gain and phase adjuster having a gain-control input tap T_1 and a phase-control input tap T_2 configured so that the voltage levels on the taps control the gain and phase of the main signal;

a main amplifier, an input of which is connected to the output of the main signal path gain and phase adjuster;

a second main path splitter, an input of which is connected to an output of the main amplifier;

a main signal path delay element, an input of which is connected to a first output of the second main path splitter,

a first main path coupler, a first input of which is connected to an output of the main signal path delay element; and

a third main path splitter, an input of which is connected to an output of the first main path coupler and a first output of which is connected to the output port and a second output of which is connected to an input of an intermodulation receiver,

the feed-forward signal path includes:

a feed-forward signal path delay element, an input of which is connected to a second output of the first main path splitter, the delay imposed by the feed-forward signal path delay element selected to approximately match the delay in the main signal caused by the main amplifier;

a feed-forward path coupler, a first input of which is connected to an output of the feed-forward signal path delay element and a second input of which is connected to an attenuator connected to a second output of the second main path splitter, the attenuation selected so that the undistorted portion of the main signal provided to the feed-forward path coupler is approximately cancelled out by the feed-forward signal;

a feed-forward path splitter, an input of which is connected to an output of the feed-forward path coupler;

a feed-forward signal path gain and phase adjuster, an input of which is connected to a first output of the feed-forward path splitter, the feed-forward signal path gain and phase adjuster having a gain-control input tap T_3 and a phase-control input tap T_4 ; and

a correctional amplifier, an input of which is connected to the output of the feed-forward signal path gain and phase adjuster and an output of which is connected to a second input of the first main path coupler, wherein the delay in the correctional amplifier is approximately equal to the delay added by the main signal path delay element, and

the detector-controller portion includes:

the switch, which is a SPDT switch, the first throw of which is connected to an output of the intermodulation receiver and the second throw of which is connected to a second output of feed-forward signal path gain and phase adjuster;

the signal-power detector/processor, an input of which is connected to the pole of the SPDT switch, the signal-power detector/processor configured to extract and process data from the signal presented to its input indicating how to steer the gain-control input tap T_1 and the phase-control input tap T_2 to minimize the signal presented to its input;

a signal-power gain controller, an input of which is connected to a first output of the signal-power detector/processor, the signal-power gain controller configured to steer the gain-control input tap T_1 in response to data provided by the signal-power detector/processor to minimize signal power at the feed-forward path splitter when the SPDT switch is set to connect the input of the signal-power detector/processor to the second output of the feed-forward path splitter and to minimize the intermodulation received by the intermodulation receiver when the SPDT switch is set to connect the input of the signal-power detector/processor to the output of the intermodulation receiver;

a signal-power phase controller, an input of which is connected to a second output of the signal-power detector/processor, the signal-power phase controller configured to steer the phase-control input tap T_2 in response to data provided by the signal-power detector/processor to minimize signal power at the feed-forward path splitter when the SPDT switch is set to connect the input of the signal-power detector/processor to the second output of the feed-forward path splitter and to minimize the intermodulation received by the intermodulation receiver when the SPDT switch is set to connect the input of the signal-power detector/processor to the output of the intermodulation receiver;

an intermodulation detector/processor, an input of which is connected to the output of the intermodulation receiver, the intermodulation detector/processor configured to extract and process data from the signal presented to its input indicating how to steer the gain-control input tap T_3 and the phase-control input tap T_4 to minimize the signal presented to its input;

an intermodulation gain controller, an input of which is connected to a first output of the intermodulation detector/processor and which steers the gain-control input tap T₃ in response to data provided by the intermodulation detector/processor to minimize intermodulation received by the intermodulation receiver; and

an intermodulation phase controller, an input of which is connected to a second output of the intermodulation detector/processor and which steers the phase-control input tap T₄ in response to data provided by the intermodulation detector/processor to minimize intermodulation received by the intermodulation receiver,

upon startup of the feed-forward amplifier, the SPDT switch is set so as to connect the feed-forward path splitter to the signal-power detector/processor until the total power in the feed-forward path and the intermodulation received by the intermodulation receiver are minimized, and then set so as to connect the intermodulation receiver to the signal-power detector/processor.

7. (New) A method for operating a feed-forward amplifier having a signal cancellation loop and an intermodulation cancellation loop, comprising:

on startup, operating the feed-forward amplifier so that the signal cancellation loop is balanced so as to minimize signal power in its feed-forward path; and

then, operating the feed-forward amplifier so as to minimize intermodulation at its output.

8. (New) A method for operating a feed-forward amplifier having a signal cancellation loop including a first gain and phase adjuster, a main amplifier forming a portion of a main signal path, and a feed-forward signal path output for providing a feed-forward signal, and an intermodulation cancellation loop connected to the feed-forward signal path output, including a second gain and phase adjuster, a correctional amplifier, and a correctional coupler for coupling the output of the correctional amplifier to the main signal path downstream of the main amplifier, the method comprising:

steering the first gain and phase adjuster so as to minimize signal power at the feed-forward signal path output and the second gain and phase adjuster so as to minimize intermodulation downstream of the coupler;

Attorney Docket No.: 213222.00093
Customer No. 27160

U.S. Patent Application No.
Not Yet Assigned

and then, when the signal power at the feed-forward signal path output and the intermodulation downstream of the correctional coupler reach minimums, steering both of the gain and phase adjusters so as to minimize the intermodulation downstream of the correctional coupler.